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ABSTRACT

The mission of vocational education has always been to provide a skilled work force for society. As society and work evolve through the influence of demographic, social, economic, technological, and political changes, the essential purposes of vocational education must be made appropriate for the emerging advanced technical society. To devise scenarios for creating preferred alternative futures, a combination of three perspectives can be used. The futuristic perspective involves assessing society and work by forecasting what can be, what is likely to be, and what should be. In the holistic perspective, an audit of current conditions considers the implications of a global economy, international competition, and scientific advances for vocational education. The outcomes perspective is derived from research on outcomes of education that yields new criteria for evaluation of education and training. From these perspectives, alternatives can be developed involving increased or diminished emphasis on vocational education. Staffing the education and training system of the future thus revolves around such issues as vocational teacher supply and demand, recruitment, and retention. The transition to an advanced technical society necessitates the redesign of the education and training system through (1) policy targeted at research and human resource development, (2) leadership that can implement the concepts of strategic planning to create visions and preferred scenarios, and (3) cooperation of a broad range of institutions and education and training providers in the realization of these visions. A five-page list of references concludes the document. (SK)

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Perspectives on the Education and Training System of the Future

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Foreword

The Educational Resources Information Center Clearinghouse on Adult, Career, and Vocational Education (ERIC/ACVE) is one of 16 clearinghouses in a nationwide information system that is funded by the Office of Educational Research and Improvement, U.S. Department of Education. One of the functions of the clearinghouse is to interpret the literature in the ERIC database. This paper should be of particular interest to adult and vocational education administrators, policymakers, teacher educators, and others concerned with planning for the future in educational institutions.

The profession is indebted to Warren H. Groff for his scholarship in the preparation of this paper. Dr. Groff is Dean of Academic Affairs at Shelby State Community College in Memphis, Tennessee. Until recently, he was Director of Research and Development at North Central Technical College in Mansfield, Ohio, where he had previously served as Vice President for Academic Affairs. Dr. Groff has had a wide range of administrative experiences in various contexts, including service as Assistant Dean and Assistant Professor of Higher Education, Temple University; Academic Dean, Sacred Heart College; and the first Executive Director of the Consortium for Health Education in Northwest Ohio.

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Chester K. Hansen
Acting Executive Director
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in Vocational Education

Executive Summary

The mission of vocational education has always been to provide a skilled work force for society. As society and work evolve through the influence of technology and information, the essential purposes of vocational education must also change.

Among the factors affecting the future of vocational education are the following:

- Demographic shifts, such as the aging of the baby boom generation
- Social indicators, such as widespread illiteracy
- Economic trends, such as the shift from a manufacturing to a service economy
- Technological advances that necessitate a more highly skilled work force
- Political trends that are changing the priorities of education

These forces require that the purposes of vocational education be appropriate for an advanced technical society. Multiple scenarios are beginning to emerge, ranging from the elimination of secondary vocational education to articulated collaboration between the private sector and a broad spectrum of education and training providers. To devise scenarios and use the information for creating preferred alternative futures, a combination of three perspectives can be used.

The futuristic perspective involves assessing society and work by forecasting what can be, what is likely to be, and what should be. A framework to identify aspects of the postindustrial, early technical, and advanced technical stages of society is described, along with a framework for developing alternative scenarios.

In the holistic perspective, an audit of current conditions of education and training considers the implications of a global economy, international competition, and scientific and technological advances for vocational education.

Third, a growing body of research on the outcomes of education yields new criteria for evaluation and a variety of scenarios for restructuring education and training.

From these perspectives, alternatives can be developed involving intensified or diminished emphasis on vocational education. Staffing the education and training system of the future thus revolves around a number of questions: Will there be a demand for vocational instructors, and if so, will there be a sufficient supply to meet the demand? What can be done to recruit qualified individuals to an increasingly complex profession? Once well-qualified individuals are recruited, how can they be retained?

Projections of a shortage of vocational instructors, particularly at the secondary level, lead to a number of suggested incentives for attracting recruits to teaching, such as dual-career options, extended contracts, and opportunities for updating skills. Retention of high-caliber individuals should be based on a philosophy of human resource development, beginning with socialization into the institution and a nurturing process of ongoing staff development.

Education is inextricably tied to larger social, political, and economic issues. The transition to an advanced technical society is necessitating the redesign and restructuring of the education and training system. The preferred response is planned systematic change based on a vision of the future and on theory and good research. This necessitates (1) national and state policy targeted at research and development and human resource development, (2) leadership that can implement the concepts of strategic planning to create visions and preferred scenarios, and (3) the cooperation of a broad range of institutions and education and training providers in the realization of these visions.

Information on future perspectives for education and training can be found in the ERIC system using the following descriptors: Economic Factors, Educational Demand, *Educational Trends, *Futures (of Society), Holistic Approach, Labor Turnover, *Long Range Planning, Outcomes of Education, Social Indicators, Teacher Education, Teacher Recruitment, *Teacher Supply and Demand, Technological Advancement, *Vocational Education. Asterisks indicate descriptors having particular relevance.

Introduction

Institutions are "of society," that is, they are created to fill a role that society has deemed necessary to its well-being. As society evolved from a primitive to an agricultural and then to an industrial stage, numerous distinctive institutions were created to plan and coordinate specialized functions that could contribute to the quality of life of that society. During the agricultural stage, this nation experienced the growth of elementary schools in rural areas, the development of a few secondary schools in metropolitan areas, and the development of a few private colleges for the elite who were destined for the professions of law, medicine, teaching, and ministry.

During the industrial era, this nation experienced major advances in systems for schools, transportation, communications, economics, finance, and research and development. Public high schools and colleges were developed to provide the work force to run the systems. The numerous distinctive institutions that were created incorporated the underlying principles of the society of which they were a part. At the peak of the industrial society, these underlying principles included the division of labor, the hierarchical structure, and the principles of standardization. Schools, for example, were designed to produce compliant workers who would be comfortable assembling things on a conveyor belt. Students were processed through 8 to 12 years of compulsory education and training. Schools and colleges were designed primarily like broadcast television—education and training services were delivered in uniform packages and in a manner and at a time convenient to the provider. Competencies, skills, attitudes, and values acquired in those formative years were expected to last a lifetime.

The role of the teacher during the agricultural society was relatively unsophisticated. The basic ingredients of a "classroom" consisted of a few students, a person who was literate and willing to teach the students under the conditions provided by the sponsors, and a few things we now call instructional materials. As this nation advanced into the industrial society, new knowledge was produced that was needed by the work force. The one-room school was transformed into larger units to respond to the needs of the changing society. The curriculum was expanded and the role of the teacher became more specialized. In order to meet the need for more and better teachers, public teachers colleges were developed, and professional teacher education began to evolve along with certification requirements for entry into the profession and licensure for those following selected career paths.

Professional study in teacher education evolved approximately 50 years ago and has remained relatively unchanged. Teacher education programs, however, did not produce sufficient numbers and specializations to staff selected areas in vocational and technical education. Teachers were recruited from business and industry and other establishments to staff selected areas.

During the 1940s the United States became an industrial giant. Spurred by World War II, this nation expanded its manufacturing capacity to meet virtually all the needs of domestic

markets and a large share of international markets. Many members of American society, however, were on the periphery of the American dream of equality of opportunity in that they were excluded from forms of education (Vaughan 1983). On July 13, 1946, President Harry S. Truman created the President's Commission on Higher Education (PCHE). The Truman Commission issued its six-volume report on December 11, 1947, under the title *Higher Education for American Democracy* (PCHE 1947). The Commission's report called for revolutionizing American higher education by opening its doors to members of lower socioeconomic groups, blacks, women, working adults, and other segments of society previously denied access to postsecondary education. The goal was to be achieved through a network of 2-year colleges. Because of U.S. industrial strength, many of the courses of study that were developed were 1-year certificate and 2-year associate degree programs in the applied sciences. Planning focused on acquiring more resources and building facilities for the increased number of students resulting from the demand for equality of opportunity.

World War II devastated many of the industrialized nations of the world. These nations rebuilt their physical infrastructure with new technology, much of which was produced by U.S. research and development and money. A new level of international competition emerged characterized by WW II technology in the U.S. and post-WW II technology in other industrialized nations. The United States lost much of its share of international markets and helped to produce a group of competitors for its domestic markets. Massive dislocations occurred when plants and entire industries moved from one location to another. For example, the textiles industry, the dominance of which the United States had captured from England during the early industrial society, moved from New England to the South and is now moving from one developing nation to another. Vocational and technical education programs in the schools and colleges were developed or eliminated based on the employment structure of a region.

Education and training experienced another impetus when Sputniks I and II were launched in 1957. Education and training programs were expanded in order to produce the large numbers of engineers, scientists, and technicians necessary to compete in the space race. This nation launched large-scale projects to redesign the education and training industry. The United States had achieved supremacy during the agricultural society by creating research and development centers at land grant universities and a network of agricultural extension agents scattered throughout the nation. The purpose of this network was to develop new knowledge, to demonstrate its use, and to disseminate that information to a broad range of consumers. Paralleling this agricultural extension model, a network of research and development centers, regional educational laboratories, and Educational Resources Information Center (ERIC) clearinghouses was developed. The purpose of this network was to reduce the lag between the development of new knowledge and its use in education and training. In addition, projects were initiated to redesign mathematics and the sciences by calling upon the expertise of mathematicians, physicists, and other scientists. The elementary and secondary schools and higher education system went through a wrenching retraining experience to deal with the multiple new math and new science curricula. Perhaps we learned something about how to teach better mathematics or better science. However, did we learn how to teach mathematics and science better to the diverse array of persons who had been granted access to education and training programs?

Research and development centers, sponsored by the federal government and multinational corporations, continue to spawn contemporary, highly sophisticated technology. Technological advances and a structural transition to a global economy provided the impetus for the recent batch of reports on education and training. The need for education and training is increasing. The shift from an industrial to a technical, information-based society makes imperative a conceptual framework to guide public policy and decision making.

A summary of the recent major reports on education suggests at least four areas of agreement: (1) the quality of our educational system must be improved, and improved now; (2) quality and equality are inseparable issues; (3) education is inextricably tied to larger social, political, and economic issues; and (4) the strength of our educational system lies in its decentralized structure and control by individual communities (National Commission on Secondary Vocational Education 1984; National Institute of Education 1984).

There is no doubt that education and training will change. The key issue is how that change will occur. There are at least two major ways change can occur: (1) planned systematic change based on a vision of the future and on theory and good research, or (2) rules and regulations that may not be based on good research. Planned systematic change based on good research would include information about "doing the right things" and "doing things right." "Doing the right things" mandates that education and training take a macro view at the society that they serve. This stance is suggested in Alvin Toffler's (1980) statement "All education springs from some image of the future" or John Naisbitt's (1982) three-word history of the United States: "farmer, worker, clerk." We could view the transition from 1955 through 1985 as "postindustrial society," the period from 1985 through 2000 as the "early technical society," and the period from 2000 through 2020 as the "advanced technical society." What will society and work be like in the early and advanced technical society? What will be the essential purposes of vocational and technical education in the technical society? If vocational and technical education curricula exist in schools and colleges, what will be the role of the teacher and where will teachers come from? "Doing things right" mandates that education and training use basic research about such things as better use of time, interactive teaching strategies, organizational climate, raising expectations, community involvement, student and personnel performance appraisal, use of technology to enhance learning, program review, administrative leadership, and effective organization.

The research evidence about organizational change is quite clear in at least three areas. First, quality is a function of expectations and money. If you expect high quality, implement systems to achieve it, and provide financial support for it, excellence can be achieved. Second, people achieve high quality. The research evidence about productivity gains in business and industry indicates that approximately 85 percent is attributable to human factors. Productivity gains attributable to human factors in the capital-forming industry of learning are probably higher than that figure. Third, quality and excellence are contextual elements involving an extensive roster of participants through genuine alliances and partnerships. The achievement of excellence involves teachers, supervisors, curriculum developers, support personnel, administrators, and state directors working with a broad range of private and public sector representatives in a never-ending, genuine consumer-provider partnership dedicated to satisfying the needs and wants of a service area.

Even a casual review of the literature suggests various scenarios for society, schooling, and occupational education. The scenarios for education and training could be placed on a continuum ranging from macro restructuring at one end to the elimination of schools on the other end. Based on a review of the literature, this author takes a middle-of-the-road position: (1) that schools and colleges will survive as one of several competing private and public vendors of education and training services; (2) that schools and colleges will enter into genuine alliances and partnerships involving an extensive roster of participants through a variety of models appropriate for unique contexts; (3) that the alliances will harness the critical mass of intellectual talent to use basic research to develop preferred scenarios of alternative futures; and (4) that professional teacher education will redesign and restructure itself in such a way so as to regain the credibility it enjoyed at the peaks of the agricultural and industrial societies.

The rationale for this stance is based on the history of this nation and the nature of the emerging technical society based on information. This reform movement acknowledges the enormous primacy of education and training. Learning is the capital-forming industry of the advanced society. If our capitalistic form of government is to survive, then the institutions that comprise the capital-forming industries must rethink the way we manage the learning tasks of an advanced society and create the new information age paradigm. As this nation moves toward the 21st Century, we need well-educated and well-trained persons to ensure a thriving and vibrant economy and to improve the quality of life for all people. Central to the quality of education are competent teachers, who should be—

- highly skilled professionals performing the complex role of extending the abilities of individuals to their capacity,
- persons who can develop an educational system that assists students in taking charge of their own learning instead of just taking courses,
- persons who can think clearly about values and instill in others a philosophy of equality and excellence, and
- persons who can link innovations in education to the achievement of broad social policies.

The purpose of this paper is to present a number of perspectives on the education and training system of the future and to show vocational and technical educators how they can influence the future through systematic planning. Following a brief discussion of some of the factors affecting the future of vocational education, a number of emerging scenarios are described using three perspectives: futuristic, holistic, and outcomes. Frameworks for developing images and visions of the future and alternative scenarios for vocational education are included to assist in planning. By combining the three perspectives, alternatives for the future are proposed involving intensified or diminished emphases on vocational education. Finally, staffing the education and training system of the near-term future is discussed, focusing upon teacher supply and demand, recruitment, and retention. The role of a systematic human resource development policy in retaining teachers is emphasized.

Factors Affecting the Future of Vocational Education

The mission of vocational education has always been to provide a skilled work force for society. Because society and work change, the essential purposes of vocational education must also change. These essential purposes are derived from the expectations of society. An assessment of societal expectations and an audit of the existing education and training system are necessary prerequisites to any discussion about future scenarios and planning for the education and training systems of the future. Societal expectations are a function of the demographic, social, economic, technological, and political forces that have existed in the past, are currently present, and will emerge in the predictable future.

The reports about education and training provide general direction about essential purposes. Boyer (1983) stated:

> To be prepared to live in our interdependent, interconnected complex world, students must be well informed. They also must have the ability to bring together information from ideas across the disciplines, organize their thoughts, reach conclusions and in the end, use knowledge wisely. (p. 117)

Gisi and Forbes (1982) listed the following basics as essential in a high tech society:

- Critical thinking
- Problem solving
- Evaluation and analysis
- Organization and reference
- Synthesis
- Application
- Creativity
- Decision making
- Communications

During periods of rapid change, vocational education must review past ideas about essential purposes, analyze present thinking about those purposes, and then anticipate what they will be in

the future (Copa et al. 1985). This section reviews some general societal trends that are likely to affect the purposes of vocational education in the future. Included is information on demographic, social, economic, technological, and political changes.

Demographic Shifts

The median age of the U.S. population has been rising slowly but steadily. The greying of America is increasing more rapidly due to the aging of the baby boom population. The huge cohort of post-World War II babies born between 1946 and 1964 has been slowly moving toward midlife transition. This group, the largest generation in U.S. history, is 75 million strong and represents 1 out of every 3 Americans. Thus, it has a major impact on demographics. For example, in 1983, the median age of the population was 30.9 years, but on July 1, 1984 it reached 31.2 years. By the year 2000 it is expected to exceed 36 years. The baby boomers first filled maternity wards to overflowing as newborns, and then caused classroom and teacher shortages in elementary, secondary, and postsecondary education. As young adults, they challenged traditional institutions, and now they are transforming workplace values and practices.

The demographic profile related to age varies considerably from state to state and region to region. Projections show a decline in the number of high school graduates in all but 10 states between 1979 and 1995. Eleven states expect a decline of 30 percent or more, and Washington, D.C. expects a decline of 59 percent. Of the 10 states expecting an increase, 6 expect a rise of 10 percent or more with Utah leading the way with 58 percent, followed by Wyoming with 49 percent and Idaho with 28 percent.

These data, however, represent but one dimension of the impact of the demographic shifts. Population migrations, the babies of the baby boomers, immigration, and different fertility rates all have their impact. The 1980 Census reveals that the average white American is 31 years old, the average black American is 25, and the average Hispanic is 22. Stated another way, one of four white Americans is young, one of three black Americans is young, and one of two Hispanic Americans is young. California and all of the 25 largest city school systems in the nation have "minority majorities" (Hodgkinson 1985). By the year 2000, minority children under age 5 will constitute 56 percent of all children in the 5 southwestern states of Arizona, California, Colorado, New Mexico, and Texas. Of those minority children, 70 percent will be Hispanic. The proportion of minority students aged 20 to 29 in that region will increase from 35 to nearly 45 percent by the year 2000. Thus, minorities will be a majority of the school-age population and then a majority of the work force (Dolman and Kaufman 1985).

Social Indicators and Expectations

The values and expectations of people are key determinants of behavior. Understanding what people want to change and what they hope will remain the same is vital to policy and decision makers. There are several ways to determine the values and expectations people hold. The Census Bureau regularly collects social indicator data on population and the family, health and nutrition, housing and environment, transportation, public safety, education and training, work patterns, social security and welfare, income and productivity, social participation, and culture and use of leisure. Analysis of these and other research data provides some insight about behavior and changes that are likely to occur.

Three social indicators deserve special comment. The first is the illiteracy rate. Research indicates that one out of five persons is functionally illiterate; that is, they cannot read or write at a level that allows them to function productively. An additional 20 percent are marginally illiterate; that is, they have difficulty in performing these basic skills. Illiteracy is not spread evenly among the people of this nation. For youth up to the age of 17, 13 percent of white American youth are illiterate, 43 percent of black American youth are illiterate, and 56 percent of Hispanic American youth are illiterate. Illiteracy, however, goes far beyond the traditional definition that deals with reading comprehension. Other dimensions include writing, speaking, listening, mathematical, occupational, research, information processing, management systems, economic, scientific, and technological illiteracy (American Council of Life Insurance 1983).

A second social indicator that is likely to influence vocational and technical education is underemployment. Underemployment is a developing socioeconomic problem (Meyer 1985). Unlike unemployment, which is a familiar concept, underemployment is a term that is not understood by the public, but it affects many individuals in the work force. Workers can be considered underemployed when working in jobs below their capacity, earning low wages, working short hours, or some combination of the three. Groups most likely to experience underemployment include farm workers, women, youth, minorities, and college graduates.

A third social indicator of special interest to vocational and technical educators is the changing nature of the family. Although many have expressed concern that current changes in American society are weakening the family, there is evidence that it is still a flourishing social unit (Miller 1984). Many of the changes in the family are related to the increased numbers of women in the work force resulting both from family economic need and women's desire to pursue satisfying careers. Families also tend to be smaller, to be headed by a single parent, and to be geographically distant from extended family members.

Economic Trends

Toffler (1980) described periods of society using the analogy of the agricultural, industrial, and technological waves, and he elaborated on the turbulence created as one wave rolls in and another recedes. Molitor (1981) described the transition from one type of society to another in terms of the work force. He indicated that in 1920, 53 percent of the American work force was employed in manufacturing, commerce, and industry; 28 percent of the workers were engaged in agriculture and extractive industries; and 19 percent were employed in information, knowledge, education, and other service enterprises. By 1976, 29 percent were in manufacturing, 4 percent in agriculture, 50 percent were in information, and 17 percent were in other service occupations. By the year 2000, 22 percent are predicted to be in manufacturing, 2 percent in agriculture, 66 percent in information, and 10 percent in other services.

What must be understood is the fundamental character of each society and the rate of change from one society to another. The agricultural and the hunting societies were characterized as humans interacting with nature—growing things and extracting things from nature. The industrial society was characterized as people fabricating goods and products—work consisted primarily of taking extracted raw materials and combining them into finished products that could be used by various peoples in domestic and international markets. Cleveland (1985) indicated that the development of new knowledge and technology during the agricultural society allowed us to grow more food with fewer humans, thereby freeing resources to develop the industrial society. The transition from the agricultural society to the industrial society took a very long time. The emerging technical society based on the exchange of information can be characterized as humans inter-

acting with ideas and knowledge. The nature of work consists primarily of accessing data, organizing the information into new knowledge, and applying this wisdom in new ways and more quickly than competitors. The transition to the technical society is occurring very rapidly due to the sudden emergence of communications and information technologies and the internationalization of a global economy.

The transition to a technical society is not uniform throughout the nation. The impact is most severe on communities that relied heavily on the old smokestack manufacturing industries that have felt the sting of international competition or that are subject to automation or the unprecedented infusion of contemporary technology into the workplace. For example, in Richland County, Ohio, manufacturing accounted for 51 percent of the jobs in 1970 and 41 percent of the jobs in 1980. These figures contrast with 44 percent and 35 percent for Ohio and 26 percent and 21 percent in the United States for the same period. In some communities, the structural economic transition has caused an epidemic of plant shutdowns and left behind a trail of human and community devastation (Groff 1981). This phenomenon has provided the impetus for new programs that deal with retraining the dislocated or displaced worker, upgrading the current work force through job training, technology transfer, entrepreneurship and intrapreneurship, incubators, economic development, and community development (Groff 1983).

Technological Advances

Technology exists for producing almost all durable or nondurable goods or for delivery of almost every service. Various ways to classify technology have been developed. Edling (1982) wrote about devices and processes. Watcke (1982-83) developed a list of high technologies. Moody (1982) listed components of the office of the future, or the paperless office, as word processing, personal computers, electronic mail, computer-assisted retrieval, computer-output microfilm, facsimile devices, teleconferencing, and reprographics.

New technology can be applied to every aspect of manufacturing: (1) engineering and design, (2) planning for manufacturing, (3) fabrication and assembly, and (4) marketing and distribution. The transition from current methods to a fully computer-integrated manufacturing process will take a considerable amount of time. State-of-the-art technology is fragmented and consists of individual computer-aided functions that provide greater speed, efficiency, accuracy, and repeatability for individual tasks. Data bases are not uniform throughout the series of manufacturing operations. In the factory of the future, computer-aided machines will be sequenced together with automatic handling and transport of materials as they make the journey from raw material to finished product.

In 1940, 20 percent of the jobs in the United States were classified as skilled and required some advanced training; 80 percent were classified as unskilled. By 1984, these percentages were reversed. The society in which we now live requires a work force skilled in new ways. Research, however, has documented repeatedly that many employees lack basic education and training for specific jobs that exist in today's world of work. The technical society based on information will require a work force more highly trained than the current one—people who are skilled and flexible, constantly innovating, integrating, and collaborating (American Council of Life Insurance 1983).

Political Change

Educational institutions are created to fill a necessary role for the well-being of society. Viewed in this light, education takes its place alongside human services, government, defense, housing, transportation, and other interests that claim to affect the quality of life. The education lobby has not been overwhelmingly successful in elevating education to a top national or state priority. Whatever priority education currently has is attributable, for the most part, to a roster of participants who perceive education and training as the critical variable in the solution of a number of economic and social problems.

All levels of government are renewing their focus on educational reform, spurred by the many recent reports on education. Reform in education can occur in two essential ways: (1) through leadership by educators, based on sound research or (2) through political action groups. In both, substantive change must be mediated through a political process in order to obtain the support and resources necessary to bring about meaningful change.

Conclusion

The areas reviewed in this section are inextricably linked to the occupational structure of the future and thus to the future purposes of vocational education. Nationally, most occupational growth is expected in low-level clerical and service occupations requiring short periods of training, mostly done on the job (Doeringer and Vermeulen 1981; Rumberger 1984; Rumberger and Levin 1984). In addition, the demand for skilled workers will grow in high tech, genetic, and information industries. The geographic distribution, concentration, and rate of change of both the population and industries are providing the impetus for a reexamination of essential purposes of vocational education. These discussions should lead to multiple visions and scenarios of how to manage the learning tasks of an advanced society.

Future Perspectives on Vocational Education

Ours is a society based on work (Carnevale 1984). An individual's welfare in American society depends upon that person's ability to work. It is estimated that 90 percent of the present work force will still be working in 1990 and 75 percent of this work force will be working in the year 2000. If predictions prove correct, by 1990, thousands of jobs may be eliminated or drastically changed by advances in science and technology and through tough international competition. In fact, most of the available jobs in the year 2000 have probably not even been described yet. Two-thirds of the U.S. population by the year 2000 will earn a living by creating, managing, and controlling information. The purposes of vocational education must be appropriate for an advanced technical society.

Clearly, multiple scenarios are beginning to emerge, ranging from elimination of vocational programs in the secondary schools to articulated collaborative partnership between the private sector and a broad spectrum of education and training service providers. The latter models are capitalistic ventures designed to create world-class contemporary technology centers to help this nation regain preeminence as an international leader in selected fields. The work force required to sustain such efforts will differ markedly from region to region. This section outlines strategies that can be used in planning for the future and describes some alternative scenarios for vocational education.

A Futuristic, Holistic, Outcomes Perspective

It is predicted that there will be more technological change between now and the year 2000 than in all of previous history. The unprecedented scope and rate of change in science and technology affect each sector of society. As dramatic as the explosion in science and technology is, however, it is not a sudden, isolated occurrence. Rather, the explosion is the cumulative effect of integrating complex technology from a variety of fields that have evolved at an ever-increasing rate for the past 30 or so years. The challenge is to develop a way to scan the environment for information with which to anticipate and create preferred alternative futures.

A Futuristic Perspective

Toffler (1980) stated, "All education springs from some image of the future." The challenge to advocates of reform in education and training is to develop a vision of the future and a preferred scenario and to translate that vision of the future into a plan of work. To deal with that challenge requires a commitment to key concepts about the study of the future and a planning horizon.

There are several key concepts in studying the future. First, the future is not fixed or preordained. Numerous alternative futures are possible. Imagination and creativity are essential in developing composites of alternative futures. Second, studying the future involves forecasts of alternative scenarios: (1) what can be, or the possible; (2) what is likely to be, or the probable; and (3) what should be, or the preferable. Third, our orientation and training work against the development of vivid visions of alternative futures. We are encumbered by the way in which we were programmed into society, by the disciplines and universe of knowledge to which we have been exposed, and by the practices and procedures with which we institutionalized the teaching tasks of the industrial society.

With regard to a planning horizon, we could set our sights on the year 2020. Why 2020? First, from a physical plant and fiscal resources planning perspective, facilities we create now will be a part of the learning environment for the next 30 to 50 years. Second, from a human resources planning perspective, persons now going through undergraduate programs or in their early professional development could still be working in the education and training industry until the year 2020 or beyond.

The second point deserves additional comment. Assume that professional teacher education produces a statement about essential purposes for vocational education within the next several years, perhaps based on research evidence such as that produced by Lewis and Pratzner (1984). Assume also that professional teacher education develops several alternative models for the preservice preparation of vocational teachers to fit the multiple scenarios ranging from the elimination of vocational education to the creation of fully articulated contemporary technology programs. It would then take years to restructure current teacher education programs to produce the numbers and the quality of persons to staff vocational needs at the secondary and postsecondary levels, not to mention trainers employed by business and industry. It would take years beyond full-scale implementation of restructured teacher education programs to accumulate research evidence about the impact of this new breed of vocational teachers on student learner outcomes, on change in schools and colleges, and, perhaps more important, on helping this nation regain preeminence in the improvement of the quality of life for the peoples of the world.

Thus, it is absolutely essential that vocational education have both a long-term and a short-term horizon to meet the need for quality teachers. With regard to the long-term horizon, the framework for developing images and visions that has been suggested is displayed in figure 1. The spaces in this figure can be filled in with information on the condition of business and industry, health and human service, government and the military, and education and training in the past (postindustrial), present (early technical), and future (advanced technical).

One scenario could be the elimination of vocational education from the secondary schools. A second scenario could be the elimination of general education and the expansion of vocational education programs. A third scenario could be a broad-scale commitment to retrain and upgrade the existing work force (customized training) through the existing delivery system. A fourth scenario could be an information age Morrill Act to create world-class contemporary technology centers with school-college-business training partnerships. Other strategic directions are possible. In addition, numerous tactical alternatives are possible within each strategic direction. For example, a science, technology, and society sequence could be structured into the curriculum beginning in the elementary grades; 2 + 2 "tech prep," which is a 4-year technical training program begun during the last two years of high school and completed with two years of postsecondary training, could be developed; technology-intensive delivery systems could be implemented; or lifelong cooperative education programs could be developed. A framework for specifying alternative scenarios is displayed in figure 2. The spaces in the figure can be filled in with the implications of each option for the early and advanced technical societies.

	1955	1985	2000 2020
	Postindustrial Society	Early Technical Society	Advanced Technical Society
Business and Industry			
Health and Human Service			
Government and Military			
Education and Training			

Figure 1. Framework for developing images and visions of the future

Strategic Options	Early Technical Society	Advanced Technical Society
1. Elimination of vocational education from secondary schools		
2. Elimination of general education and expansion of vocational education programs		
3. Broad-scale commitment to retrain and upgrade the existing work force through the existing delivery system		
4. An information age Morrill Act to create world-class contemporary technology centers with school-college-business training partnerships		

Figure 2. Framework for developing alternative scenarios for vocational education

A Holistic Perspective

Graubard (1967) stated that by the turn of the 21st century, certain municipalities would be primarily "educational" in the broadest sense, just as certain cities are primarily "textile," "banking," "transportation," and so forth in today's society. What he suggested is a consortium of ideas and programs that goes beyond the parochial view of "institution." When we get rid of the illusion that education and training are the exclusive domain of schools and colleges, then we can ask a new set of questions about exciting terrain that has profound implications for vocational education.

Even the scenario suggesting the elimination of vocational education from the secondary schools has implications that are profound. Some characteristics of an advanced society based on the exchange of information are already quite evident. American products once claimed 30 percent of world markets and 95 percent of our domestic market. By the early 1980s, American products claimed only 15 percent of world markets and 65 percent of the U.S. markets. Mahoney and Sakamoto (1985) presented the following facts about international trade:

- International trade accounts for 22 percent of the gross national product.
- Export accounts for 20 percent of our industrial production.
- One in six production jobs in this country is dependent on exports.
- One-third of American corporate profits are from international activities.
- Goods for export are produced on 40 percent of American farmland.
- Every billion dollars worth of exports creates 25,000 jobs for Americans, and, conversely, about 5 million Americans were unemployed in 1985 because of the federal trade deficit.
- For the first time in history America has become a debtor nation.
- In California, 1 million jobs depend on foreign trade for a total of $10.5 billion in wages and salaries, and approximately $3.5 billion in taxes and $35 billion in business revenue is brought into the state by international trade.
- In South Carolina, 15.5 percent of the gross state product is represented by manufacturing exports, 54,000 jobs are directly dependent on exports, and about 580 companies are involved in international trade.
- In North Carolina, as many as 50,000 persons are employed because of its export activities.

An unprecedented battle is being waged among industrial nations for world supremacy in developing markets for products and services. Not too long ago, information technology—data processing and telecommunications—was viewed by business and industry as just another expense that had to be monitored and controlled through the budgeting process. The world is rapidly moving in a direction that will enable investors around the world to buy and sell stocks, products, and services by tapping into a few key communications systems. Buyers and sellers can scan the globe for potential customers and negotiate bilateral and multicorporate exchanges in a matter of minutes. Domestic and international research libraries and data bases that were the exclusive preview of the Fortune 500 are becoming absolutely essential for survival. The work force of the future will need to understand (1) products and services that establishments are already exporting or could export; (2) the technology to deal with transactions; and (3) language, politics, law, culture, and other variables of countries around the world. Traditionally, this nation has looked to distributive education in the secondary schools and business administration in postsecondary institutions to provide the skilled work force for domestic and international marketing. Preparing a work force with proficiency in the necessary competencies will require program coherence throughout an institution, particularly in areas associated with the humanities and the topics now clustered under the label "science, technology, and society."

For scenarios that relate to the creation of world-class contemporary technology centers, the implications appear even more profound. Arnstein (1965) cited a quote by Galton about the growth of research and development (R & D):

> In its first 150 years as a nation, the United States—government and industry combined—spent some $18 billion for R & D. That total was matched in the five-year period, 1950 to 1955, and almost matched again in the single fiscal year of 1962. (p. 40)

Expenditure for R & D was estimated to be $106.6 billion in 1985 and $116.8 billion in 1986. Industry provides about 73 percent of all research, the federal government provides about 12 percent, academic institutions provide about 2.2 percent, and the remainder is provided by other nonprofit organizations (Duga and Fisher 1985).

The federal government operates 380 laboratories through 9 agencies. These laboratories, like the National Aeronautics and Space Administration, are linked together through the Federal Laboratory Consortium. In addition, the federal government supports research through the National Bureau of Standards and the National Science Foundation.

To these efforts by the federal government must be added the research and development in the private sector and initiatives at the state level. The 10th edition of *Research Centers Directory* (1986) describes over 8,300 research units in the United States and Canada, including nearly 1,000 that are new to this edition. In addition, states are funding economic development. Schaffer (1985) described Pennsylvania's Ben Franklin Partnership Program functions as joint research and development, education, and entrepreneurial assistance. Ohio's Thomas Edison Program has funded six advanced technology centers: (1) the Applied Information Technologies Research Center in Columbus, (2) the Cleveland Advanced Manufacturing Program, (3) the Animal Biotechnology Center in Athens, (4) the Polymer Innovation Corporation in Akron/Cleveland, (5) the Welding Institute in Columbus, and (6) the Institute of Advanced Manufacturing Sciences in Cincinnati.

This represents but a sample of the investment in the effort to regain preeminence in selected fields. These investments will generate new products and jobs requiring new skills. It is estimated that the growing use of lasers in industry, communications, computers, and medicine will create 600,000 new jobs in the next few years for operators and repairers. A study by the University of Michigan and the Society of Manufacturing Engineers (Smith and Wilson 1982) indicated that robotics will displace about 4 percent of the industrial work force over the next 10 years but will create more than 44,000 new robotic-related jobs—25,000 in maintenance, 12,000 in programming, 4,500 in supply firms, and 3,000 in manufacturing. These advances in science and technology have tremendous implications for vocational education.

An Outcomes Perspective

During the education reform movement of the Sputnik era, the concept of the "systems approach" took on new meaning. Simply stated, the "systems approach" includes (1) inputs, (2) process, and (3) outcomes. The commitment to research has added clarity to the concept of the systems approach and has provided insights about equality. Research has documented quite clearly the inequality of inputs—differences in students, advice and expectations of individuals, and resources. At issue in recent years was how to interpret equality and how to achieve it. One form of equality is that of process: programs and program support should be equal. A second form of equality is that of outcomes: resources should be allocated in proportion to inputs in order to

achieve identical outputs. A third form of equality is that of value added: inputs and process are inherently unequal and all people are entitled to become all they are capable of becoming. This nation has spent considerable resources in attempting to define equality of opportunity and to implement strategies for achieving it. The 1954 Brown decision provided new impetus for this issue, which has been supported in federal and state legislation.

Paralleling the issue of equality was a shift from evaluation of processes to educational outcomes—output of the institution and its impact on society. Following the publication of a book on the topic by Caffrey and Isaacs (1971), major research projects were launched by the National Center for Higher Education Management Systems (NCHEMS) and the National Center for Research in Vocational Education. The NCHEMS research was started by Micek and Arney (1973) with the release of *Outcome-Oriented Planning in Higher Education: An Approach or an Impossibility?*. This led to a review of previous attempts to structure educational outcomes (Lenning 1977b), a structure for outcomes (Lenning et al. 1977), and procedures for applying the structure (Lenning 1977a). The project concluded with a handbook for conducting community impact studies (Armijo, Micek, and Cooper 1978).

The following year, the National Center for Research in Vocational Education undertook an educational outcomes project for vocational education. The project produced a bibliography of empirical studies (Bolland 1979), an associated bibliography of related literature (Taylor, Davey, and Bolland 1979), a thesaurus of outcomes questions (Farley 1979), a framework for evaluation of outcomes (Darcy 1979), and a statement about the state of the art of impact evaluation (Grasso 1979).

The shift from time-based criteria to outcomes-oriented criteria could yield a variety of high demand scenarios. This base of research will be invaluable if this nation places excellence and quality as its highest priority and attempts to restructure education and training on the basis of outcomes-oriented criteria.

Alternative Scenarios

The three perspectives discussed in this section can be combined to develop future scenarios, the elements of which are (1) an assessment of society and work in the future (futuristic perspective), (2) an audit of current conditions of education and training (holistic perspective), and (3) our commitment to ultimate results (outcomes perspective). In the United States, the capitalistic philosophy translates into a decentralized approach in dealing with societal issues. The U.S. constitution indicates clearly that education is a state function with limited intrusion for national priorities. Therefore, policy planning and implementation will occur at the state level. Even a casual assessment of demographic, social, economic, technological, and political variables shows that a variety of scenarios are emerging and will continue to emerge in the long-range future. Some states recognize the primacy of learning as the essential value-added variable in the technical society. These states are developing a futuristic, holistic, outcomes-oriented perspective to elevate education and training to one of its highest priorities. Such states will have high demands for education that differ markedly from other states.

A report by the National Governors' Association (1983) indicated that most states have made a commitment to economic development and are requiring public education to contribute to that strategic goal. The diversity of approaches to achieving economic development is staggering. In addition, entire industries are retooling and restructuring themselves to be competitive in the global economy. Carnevale (1982), among others, has documented quite clearly the role of human capital in such efforts.

Unfortunately, education has pursued a decade of "dumbing down" entire systems. Because education has been mandated to elevate equality as a priority over quality, a generation of graduates has been produced that did not even equal, let alone surpass, levels of performance of the previous generation. Thus, business and industry were forced to make major investments in education and training leading to the emergence of corporate classrooms and colleges (Eurich 1985; Hawthorne, Libby, and Nash 1983). In the near future, business and industry will be forced to draw increasingly from an unskilled labor pool at a time when the military indicates it will need one out of every three high school graduates to operate sophisticated weapons systems. According to a Business-Higher Education Forum (1985) report, 75 percent of all workers will need retraining by the year 2000.

The Capitalistic Philosophy

Imagine demand as a function of a competition between a socialistic, centralized nation and a capitalistic, centralized-decentralized nation seeking to become the international leader in such fields as electronics or materials technology. Add to the scenario (1) the recognition of the primacy of learning as a capital-forming industry; (2) a targeted and intensified commitment to research and development; (3) a reduction in lag between research and development and its application; (4) the elevation of excellence as a matter of public policy; (5) a massive commitment to human resources development at all levels, possibly through voucher entitlements; (6) the decline of industrial era schooling and the emergence of information age paradigms that focus on learning communities; (7) an acknowledgement of vocational and technical education as a supplement to, not a substitute for, academic and liberal education; and (8) a redesigning and restructuring of professional teacher education and teacher professional development based on the needs of new information age paradigms and professional career ladders.

Contemplate the consciousness-raising that must take place to consider such demand scenarios and the staggering challenges this nation faces. The attitudes and expectations that people hold are a good prediction of behavior. The mind set cultivated and nurtured during the industrial era focused on such attitudes as an elitist management versus a cheap labor force, sometimes lower in priority than machinery and other parts of the physical infrastructure. To protect the interests of the workers, unions emerged first in business and industry and then in other institutions of society such as schools and colleges. To what extent will unions in education contribute to the redesign and restructuring of a new information age paradigm? In addition, think about the consciousness-raising that must occur in seeking the assistance of a greying America and a generation with lowered expectations, persons who are not likely to be able to realize the American dream and certainly will not attribute success in life, in any great measure, to their schooling.

Diminished Emphasis on Vocational Education

One high demand scenario seems to suggest concentration of a new breed of teachers who are capable of integrating massive amounts of information in a situation in which vocational education would be eliminated, drastically diminished, or barely touched upon in an essentially academic curriculum. The impetus for this could be based on research about effectiveness of vocational education. Carnevale (1985) concluded that on-the-job training accounts for 85 percent of human productivity increases whereas 15 percent is attributable to preemployment training. As a result, he recommended that the route to full employment and increased productivity is to get people jobs and help them to develop at work, rather than training them in the hope that there

will be positions out there to fill. Jobs create training, not vice versa. Schools and colleges have an obligation to prepare students for life in a society saturated with science and technology. At the very least, students should be exposed to the basics of science and technology and deal with issues in a structured sequence on science, technology, and society even though the context and mode could be characterized as low- or medium-technology. In such a scenario, "vocational" topics could be integrated throughout the learning sequence.

Intensified Emphasis on Vocational Education

Another scenario could be a saturation of specialists prepared to function in a variety of roles within a 21st-century learning community. Such a scenario would result from a community commitment to strategic planning that results in a vision of the future to which purposeful human and organizational activity can be linked. Such a conceptual framework would guide public policy and help to forge genuine relationships between community, education, and work. (See figure 3.) The scenario-building process would include futuring techniques that attempt to anticipate the impact of advances in science and technology on establishments and jobs and interpret that base of information in terms of change in the occupational structure and competency and skill requirements for current and future occupations. This scenario would then interpret the information into (1) generic areas of study for entry into the work force, (2) customized areas of study for retraining and upgrading the current work force, and (3) a broad range of other products and services—new research and development opportunities; creation, expansion, and retention of business; physical and social infrastructure, and so forth.

What evolves in this scenario is an extension of Graubard's (1967) municipalities with a particular concentration. The Silicon Valley, Route 128, the Research Triangle, and Battelle Laboratories are examples of this phenomenon. Southeast Michigan, southwest Pennsylvania, and southwest Ohio have possibly the largest concentration of establishments of research and development in artificial intelligence, expert systems, and automated manufacturing. Add to that image the concentration of polymer research and development in Akron/Cleveland and the specialization in ceramics in central Ohio. These materials and processes will transform Garreau's (1981) "foundry" (the industrial belt of the United States) in ways that are not altogether clear at this time. This is not something that will happen in the future. It is happening today. States where the private sector recognize the primacy of excellence in learning will support public education to the extent to which business and industry gets a high quality return on investment.

Where will teachers come from in the intensified emphasis on vocational education? In selected areas such as agriculture, office occupations, communications skills, mathematics, and physics, teachers will come from redesigned professional teacher education programs that are qualitatively superior to existing programs. In specialized areas and customized training programs, teachers will come from research and development centers, business and industry, and the military. These specialists will be provided with structured inservice programs to develop an understanding of (1) human growth and development; (2) curriculum content formats and development and sequencing of lesson plans; (3) curriculum delivery systems, including teaching strategies and the use of instructional courseware technology; and (4) ways to evaluate student learning outcomes. Instructional development specialists on these four topics will assist the teacher in developing and modifying instructional materials to meet the need of students and establishments in generic pre-entry and customized training programs.

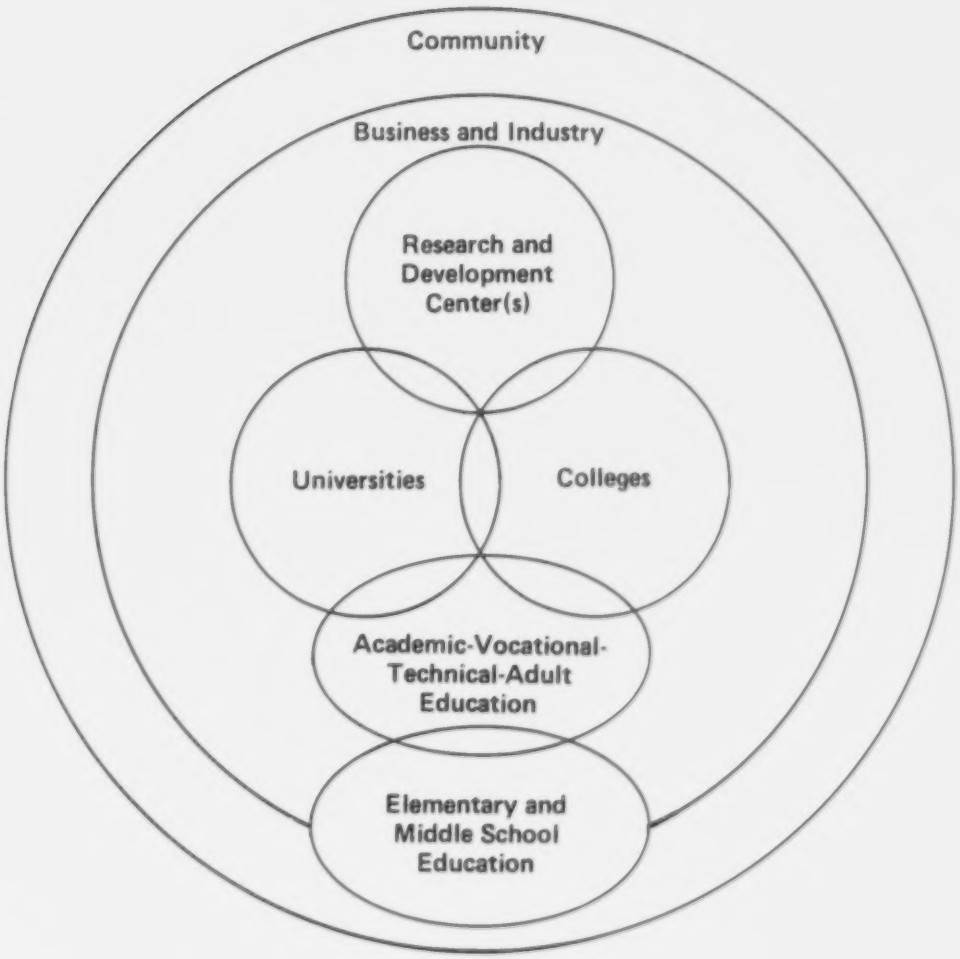

Figure 3. A conceptual framework for viewing the relationship between community, education, and work.

Conclusion

Multiple scenarios are not only possible, they are emerging today and will continue to evolve. Many entry-level jobs will require more and better education and training. The current work force must be upgraded with higher-level skills, and the displaced worker will have to be retrained for emerging occupations. Therefore, the need for high quality vocational educators will be more, not less.

In a scenario of intensified emphasis on vocational education, there would be an increase in the diversification and quality of specialists performing a variety of roles. Some vocational educators would perform entry-level prework education and training in areas that exist today. There will always be a need for a work force for the growing, extracting, processing, manufacturing, distribution, consumption, and recycling of tangible things. Agriculture and manufacturing will continue to progress by doing more with less through better knowledge that is delivered on demand, in a prescribed format, at a programmed time. In addition, an expanded list of service providers will be needed to reduce the lag between research and development and its implementation. This would include educators who understand the new technology and can assist establishments with customized training, technology transfer, anticipation of new skill requirements, remediation of human deficiencies, and a broad range of community development roles tied to the creation, expansion, and retention of local firms and the needs and wants of persons residing in a particular region.

Staffing the Education and Training System of the Future

Not long ago the role of the teacher was fairly simple. The instructional system was relatively unsophisticated and consisted primarily of a teacher and a few materials. A teacher taught what she or he was taught, experienced, knew best, liked, or had materials for. During the Sputnik-era revolution, educational research and technology began to focus on individual differences and competency-based and student-centered approaches. The following concepts formed the basis of much educational research:

- Competencies to be taught should be rigorously identified by workers and supervisors, and from the implications of advancing technology.
- Cognitive, psychomotor, and affective competencies and skills should be integrated in instructional settings.
- Instructional materials should be based on the principles that (1) knowledge of basic skills enables the achievement of competence and (2) time is a variable, competence is the constant.
- Instructional technology should complement competent faculty and be linked to curricular objectives.
- Modular and flexible units of instruction should be used so that students can progress at their own rate.
- Assessment criteria and the conditions of assessment should be explicitly stated.

The field of education began to understand that it had to shift its focus from teacher-centered activities to learner-centered activities. There was a realization that education is more than taking courses; education should help individuals take charge of their own learning. Consequently, the role of the teacher became more complex.

Curriculum became recognized as an instructional system comprised of three formats: (1) content, (2) delivery system, and (3) evaluation. The content format consists of the knowledge, skills, and attitudes that are to be learned. The delivery system consists of different ways to help students acquire knowledge, skills, and attitudes; these methods range from teacher-centered formats to teacher-free strategies. Evaluation formats range from simple, single-skill tests to demonstrations of competency requiring the integration of higher order cognitive, psychomotor, and affective abilities. Teachers and trainers need a variety of skills and abilities to carry out all the requirements of the instructional system.

When one considers the multiple scenarios that are evolving, the role of the teacher will become even more complex in the future education and training system. Increasingly, teachers are expected to perform a role within the institution, in the community, and for the profession (Wiant, Warmbrod, and Pratzner 1984). The future will undoubtedly place additional demands upon teachers and trainers.

Staffing the education and training system of the future revolves around a number of questions. First, will there be a demand for vocational instructors, and if so, will there be a sufficient supply to meet the demand? Second, what can be done to recruit qualified individuals to a profession that is becoming increasingly complex? Finally, once well-qualified individuals are recruited, how can they be retained in the profession? This section examines the topic of staffing the education and training system of the short-term future (the early technical society) by focusing upon teacher supply and demand, recruitment, and retention.

Demand and Supply

According to Lynch (1986), forecasting "the future labor market for vocational education teachers—indeed, for teachers in general—is fraught with uncertainties, in terms of demand and supply" (pp. 2-3). Despite the problems inherent in making accurate projections, a number of factors that will affect both the demand for and the supply of vocational teachers in the future can be identified. These factors, some of which are associated with the futuristic, holistic, outcomes perspective, shed some light on the future demand/supply picture for vocational teachers.

Demand

Lynch (1986) enumerated a number of elements that will affect the future demand for vocational education teachers, including labor market data, turnover rates for vocational education, funding, teacher-student ratios, an aging labor force, the back to basics movement, vocational education's image, and vocational education's response to labor market trends. Each of these factors is discussed briefly.

Labor market data compiled by the U.S. Bureau of Labor Statistics (1984) indicate that the following areas will need large numbers of employees in the future: clerical and secretarial occupations, sales and marketing, service occupations, health fields, and highly specialized technical occupational areas. Only 2 of the 50 fastest growing occupations require a baccalaureate degree, although none of them are low-skill jobs. Most will require vocational or technical training for entry (Miller and Imel, forthcoming). If vocational enrollments shift to reflect these labor market data for new and replacement workers, there will be increased demand for vocational instructors (Lynch 1986).

Turnover rates will also affect the demand for vocational teachers. Lynch cited several studies that found high teacher turnover rates in some vocational areas, leading him to conclude that "turnover rates are apparently higher in vocational subject areas than in other secondary education fields" (p. 9). If turnover rates increase, as many predict they will, demand will also increase.

Funding for vocational education will also affect the demand for teachers. Increases in funding to support vocational education will undoubtedly lead to program growth and will be accompanied by an increased demand for teachers. Likewise, decreases in overall funding levels will mean that fewer teachers will be required.

Changes in teacher-student ratios may also affect vocational teacher demand. Lynch (ibid.) cited studies that project an increase in teacher-student ratios at the secondary level. If such projections materialize, the demand for teachers at the secondary level will decrease. Since the studies cited do not look at specific subject areas, it is not possible to predict exactly how vocational education will be affected by changing teacher-student ratios.

The "greying" of the population, discussed in the first section, will also affect the demand for teachers. Although Lynch (ibid.) pointed out that "the effects of retirement upon teacher demand are not well documented in the literature . . . anecdotal evidence indicates that vocational education teachers are aging" (pp. 9-10). Increases in the number of retiring vocational teachers will affect the demand.

The "back to basics" movement or the move to increase basic academic requirements for high school graduation may have an adverse affect on the demand for vocational teachers. It is too soon to measure the overall effect of this movement on vocational education enrollments at the secondary level. If vocational programs develop curricula and courses that meet academic as well as vocational requirements, the effect of this movement may be negligible (Miller and Imel, forthcoming). However, if vocational educators do not respond to this movement in a positive way, decreased demand for teachers, especially at the secondary level, may result.

A change in the image of vocational education may also affect teacher demand. According to Lynch (1986), vocational education's image has been the subject of recent articles as well as a topic of discussion at conferences and seminars. If its image can be improved among school, community, state, and national policymakers, demand for vocational teachers may increase.

Finally, the way in which vocational education responds to labor market trends and data may affect teacher demand. Modifying existing programs and designing new ones to meet future projected training needs can increase the demand for vocational instruction (ibid.).

Supply

Between 1968 and 1982, the number of freshmen entering college who intended to teach declined steadily. In 1968, 23.5 percent or 448,365 entering freshmen indicated that they planned to teach at the elementary or secondary level. By 1982, that figure had declined to 4.7 percent or 119,850 (Lynch 1986). Lynch (1983) suggested that the following factors may be responsible for the decline in numbers of individuals choosing to enter teaching, as well as in the declining quality of prospective teachers (as measured on test scores): low pay, poor and declining status of the profession, problems related to classroom management, reports of teacher surplus, and loss of women and minorities to other professions.

These factors appear to be affecting the future supply of vocational teachers as well. Several studies reveal declines or projected shortages of teachers in the following vocational areas: agriculture, industrial arts (technology education), trade and industrial education, and marketing education (Lynch 1986).

On the basis of his analysis of various data sources, Lynch predicted that "there will be a considerable shortage of vocational education teachers, at least at the secondary level, in the years ahead" (p. 15). He concluded by stating "that if vocational education—at least at the secondary level—is to continue to be a viable education program in the years ahead, a major effort must be exerted to recruit large numbers of quality personnel into teaching vocational education" (ibid.).

Recruitment

Vocational teachers enter teaching for many of the same reasons as teachers in general: they have knowledge, skills, and interest in the subject to be taught; and they have a desire to work with young people. However, some additional factors attract individuals to vocational teaching. The first is the perception that vocational teachers have an option; they can always leave teaching for a career in business and industry. A second factor has to do with the positive experience prospective vocational teachers had with vocational programs in high school or community college. A third factor attracting individuals to vocational teaching is the work and activities associated with vocational youth organizations (Lynch 1986). These elements may make vocational teaching an attractive career choice. However, these factors must overcome or outweigh the negative factors affecting supply in order to combat the projected teacher shortage in vocational education. Some suggestions on how this may be done follow.

While recognizing that low pay is a deterrent in recruiting teachers for any area, the National Commission on Secondary Vocational Education (1984) suggested a number of other incentives that "may help in attracting high-caliber individuals to vocational classrooms" (p. 15). These incentives include scholarships, extended contracts to pay for additional months or hours of work, opportunities for updating occupational and teaching skills, time for parent and community contacts, and provision of modern instructional equipment and materials.

Lynch (1986) made the following concrete suggestions for recruiting more high quality teachers to vocational education:

- ***Stress the benefits of teaching as the primary message in recruitment communications.*** For vocational teachers this would include dual-career options; diverse experiences in the classroom, laboratory, community, and with youth organizations; and the opportunity for occupational and technical updating.

- ***Develop teacher recruitment plans.*** These plans, which should be developed by national, state, and local agencies and associations as well as colleges of education, should include goals and objectives, specific activities, funding, and the names of individuals responsible for implementation.

- ***Identify various segments of the potential audience and target appropriate messages and techniques for each.*** Segments to be targeted include individuals currently enrolled in high school and postsecondary vocational programs; college-bound seniors with an expressed interest in teaching; former teachers; former education majors who chose not to teach; retired military personnel; business and industry personnel; and homemakers.

- ***Designate a professional recruiter in large agencies such as university vocational education departments, state departments, and local school districts.*** The recruiter would be responsible for planning, conducting or coordinating, and evaluating recruitment activities.

A recent critique of teacher labor market studies (Berry, Noblit, and Hare 1985) contained a number of policy recommendations regarding teacher recruitment. Although not related specifically to vocational education, the following suggestions could be implemented in recruiting vocational teachers:

- School systems must attend to the school culture that currently frustrates and alienates teachers and causes individuals not to choose teaching.

- Legislatures and state education agencies should permit school systems to be more flexible in their recruiting and hiring practices.

- Staff support for teachers should be expanded because of the demands of extracurricular activities or other auxiliary functions.

- School systems that are located near industries and universities may attract individuals to teaching by—

  —hiring able, but noncertified, teachers and assisting them in receiving certification; and

  —recruiting spouses of employees transferring into the community.

- Rural school systems can emphasize the benefits of rural living in recruiting teachers in the same manner that industries attract employees to nonurban sites.

Retention

Attracting quality teachers represents only the beginning step in staffing the future vocational education and training system. It is also important to retain high-caliber individuals who choose teaching as a career. Findings from a number of studies reveal that the most academically able teachers—including those in vocational areas—are the ones who leave teaching. It has also been suggested that many who enter the teaching field do not view it as a permanent career (Lynch 1986). Two recent reports, *Tomorrow's Teachers* (1986) and *A Nation Prepared* (1986), have proposed a number of changes that need to be made if the teaching profession is to attract and retain quality teachers. If implemented, these recommendations will change the fundamental structure of the teaching profession as well as enhance recruitment and retention of quality teachers. Policy changes, such as those recommended in these two reports, take time to implement, and their results will likely not be felt until the long-term future (the advanced technical society). They also involve changes at the macro-level of the profession. Individual institutions can implement policies at the micro-level in order to retain the quality teachers they have recruited. By nurturing personnel through a program of human resource development, institutions can play a major role in teacher retention. The remainder of this section discusses how human resource development can be instrumental in retaining teachers.

Human Resource Development

A philosophy about human resource development should form the basis for staff development programs. A human resource development philosophy would include the following elements:

- Humans are the most important resource of the institution.

- Competence is an additive process; talents and skills of individuals within the institution must be cultivated systematically.

- Persons to be affected by plans and decisions should have a role in making them.
- Involvement in planning leads to a purposeful commitment and investment of time on the part of the participant.
- Collaborative goal setting represents a way of creating mutually beneficial futures and working toward building solutions rather than trying to escape from irreconcilable problems.

Human resource development begins with socialization of the individual into the institution and continues with a nurturing process that will provide ongoing staff development.

Socialization into the Institution

Once the decision is made to hire a person, the formal process of socialization into the institution begins. A great deal of information may have been exchanged between the applicant and the institution during the interview process, but the flow of information is greatly accelerated when the contractual relationship has been finalized. Parsons' (1985) monograph discusses the socialization process in detail.

Handbooks are invaluable sources of information for both full-time and part-time personnel. Such documents usually contain many of the policies and procedures adopted by the institution. The handbook can provide a bit of history, the table of organization, policies about student affairs and services, and administrative procedures. Legal issues are of particular importance, and the handbook could include items such as the legal status of students, grading, disciplinary sanctions, plagiarism and cheating, the student appeal process and grievance system, student files and records, the Copyright Act of 1976, and faculty rights.

An orientation session for full-time and part-time instructional staff is of great value. Orientation sessions provide the opportunity for institutional leaders to reaffirm the mission and essential purposes of the institution and to lay out the plan of work to be accomplished during the next time period—academic year, semester, or quarter. Departmental orientation sessions provide an opportunity for individuals to reach consensus about a plan of work for their unit and to begin to integrate new employees into the system.

Orientation sessions also provide an opportunity to begin or continue professional development. Even persons graduating from the best professional teacher education programs and having some experience in one context will need to make adjustments to the new context. The mix of students, content format, the delivery system, and the evaluation format will all be different. These topics form the agenda for the orientation session for the experienced professional. They also form the agenda for the person who has technical skills, but who is new to teaching. For the newcomer, the topics are very basic: (1) what is a lesson plan, (2) what is an instructional objective, (3) what instructional materials are needed to achieve the objective, and (4) how can student learning be evaluated?

Nurturing

Choosing a career or changing to a new career is one of the most important and difficult decisions a person makes. The transition from a high quality professional teacher education program

to the classroom at any level is difficult even when the person has a solid grasp of human growth and development, curriculum content, teaching strategies and techniques, and evaluation methodologies. The transition is many times more difficult for the person with the technical background but without pedagogical training, particularly if the population being served is disinterested adolescents or employees in mandatory training sessions. The systematic nurturing of human resources is essential to retaining teachers as well as to improve the quality of education.

Nurturing involves such group variables as structure and composition of work groups, peer group phenomenon, and leadership. Nurturing also involves organizational factors such as (1) role clarity, (2) communications, (3) feedback patterns, (4) incentives and disincentives, (5) career paths, and (6) professional education and training development. Membership in professional and trade associations is integral to the nurturing process. Reading professional publications and interacting with persons having similar interests are basic elements in a structured program of professional development.

A comprehensive planning process provides a basis for human resource development. The annual planning cycle can include the specification and review of assumptions about future conditions, the setting of goals and objectives, and the linking of resources to high priorities. Assumptions, which are essentially interpretations about external conditions, could be specified for any number of categories, such as (1) societal context, (2) quality of life and quality of workplace issues, (3) human resource development needs, and (4) physical infrastructure needs. Goals and objectives, which are internal targets, could be set for such categories as (1) external environment, (2) qualitative improvements, (3) human resources development, and (4) capital planning. (See figure 4.)

Assumptions (Essentially External)	Goals and Objectives (Internal)
A. Societal Context	A. External Environment
1. Demographic Trends	1. Needs Assessment/Market Analysis
2. Social Expectations	2. Mission Attainment
3. Economic Trends (by Industry)	3. Functional Relationships
4. Technological Advances	4. Public Relations
5. Governmental Planning	
B. Quality of Life/Workplace Issues	B. Qualitative Improvements
1. Business Climate	1. Academic Affairs
2. Labor-Management Relations	2. Student Services
3. Quality Circles	3. Administrative Support
C. Human Resource Development Needs	C. Human Resource Development
1. Education and Training Needs	1. Teaching Staff
2. Research and Development Needs	2. Professional Staff
3. Technology Transfer Needs	3. Administrative Support
D. Physical Infrastructure Needs	D. Capital Planning
1. Communications Systems	1. Equipment
2. Transportation Systems	2. Physical Plant
3. Utility Systems	3. Dollars

Figure 4. Categories of assumptions, goals, and objectives

Assumptions can be specified and goals and objectives can be set at the system, district, facility, and departmental levels. For example, if a system or district assumes vocational education will be greatly diminished or eliminated, what are the long-range goals and short-term objectives for (1) vocational programs (students, personnel, facilities) and (2) preparing K-12 students for life in an increasingly scientific and technological society?

The process is even more important for other strategic or tactical scenarios described earlier in this paper. It is impossible for educational leadership to envision all the changes that will take place over the next several years. Besides, even if educational leaders could envision most or some of the changes, they would then have to "sell" those changes to the instructional staff who could be antagonistic about implementing them because they had no role in the early discussion stages and hence no commitment to a strategic direction or tactical alternative. In fact, teachers may view the exercise as counterproductive if the resources that normally would have been directed to their programs are now being used to promote a new direction that may or may not have been based on sound market research.

There are other ways of nurturing or sustaining professional development. In multiple-person departments, each course can be assigned to a full-time member of the faculty. That person can maintain a common course outline and syllabus backed up with lesson plans and instructional materials. All of these materials would be made available to all full-time and part-time day and evening faculty. In large departments, a curriculum coordinator can take responsibility for coordinating articulation between courses in the program and with other departments.

Performance appraisal is another way to nurture professional development. Periodic evaluations of teaching performance can lead to positive growth experiences. During performance appraisals, instructors can be encouraged to make individual staff development plans. These plans can focus on improving existing knowledge and skills as well as developing new areas of expertise. Performance appraisals also present an opportunity to provide positive reinforcement for excellent or exemplary performance.

Conclusion

Education is faced with a multifaceted problem: (1) it must recruit better quality persons to enter teaching, (2) it must prepare better quality teachers, (3) it must retain a higher percentage of the highest quality teachers, and (4) it must restructure its programs. Even persons graduating from the best professional teacher education programs need a conceptual framework and a structured professional development program to mature as professionals in areas of human growth and development, curriculum content, delivery system, and evaluating student learning outcomes. Persons who may have technical expertise but lack pedagogical background need even more professional development experiences.

The diversity of the student body, rapid technological change, and the expanded role of the teacher will require institutions, particularly community colleges, to devote more and more resources to upgrading their personnel. Within the past few years we have gone through the transition from electric typewriters to stand-alone word processing units to local area networks linked to mainframe computers. Comparable changes are occurring in other fields, such as computer-assisted design and manufacturing, robotics, lasers, fiber optics, and communications technologies. Such changes are possible in direct proportion to the commitment to human resource development. In addition, the expanded list of programs related to economic development will require schools and colleges to link more closely the concepts of strategic planning, organizational development, personnel development, resource development, and accreditation. These changes will require teachers who are creative and flexible.

Summary

The reports on education suggest at least four areas of agreement: (1) the quality of our educational system must be improved; (2) quality and equality are inseparable issues; (3) education is inextricably tied to larger social, political, and economic issues; and (4) the strength of our educational system lies in its decentralized structure and, in the case of public schools, control by individual communities. The reports also identify issues related to the redesign and restructuring of the education and training industry, such as how to recruit better qualified persons into teaching, how to prepare teachers better, how to retain and reward competent teachers, and how to collaborate in the redesign and restructuring of education and training programs and services. There are at least two major ways change can occur: (1) planned systematic change based on a vision of the future and on theory and good research and (2) rules and regulations that are reactionary and not based on research. The first of these two strategies form the basis for the following observations.

National and State Policy

It is possible to develop the case that the federal era in education is waning. Such a position could be argued on the basis of (1) the constitution and the current administration's policies on deregulation; (2) economic effects of federal budget deficits; (3) high costs of interest on the national debt; (4) large military weapons expenditures and planned new weapons systems; and (5) international issues including the strong dollar and trade imbalances. History indicates quite clearly that education has never received huge appropriations in contrast to other priorities. Today, it consists of 2 percent of the federal budget. The technological revolution and the internationalization of the economy are global phenomena with regional and state variations. Therefore, the federal government will continue to have some role in education.

A capitalistic nation needs the critical mass of intellectual capital and trained persons to compete in a global economy. It is far more efficient, let alone effective and humane, to do the job well during the early years and in a system supported at public expense than to remediate people at a later point in life and at a greater cost. Also, a great part of the economic growth in the United States is attributable to small companies that cannot afford corporate colleges. Therefore, in the long term, national and state policy will be targeted at research and development and human resource development needs.

Leadership and Strategic Planning

Research indicates that leaders tend to be remarkedly well-balanced people who embody four areas of competency: (1) vision, (2) the ability to communicate that vision, (3) positive self-regard, and (4) building trust with associates. Many leaders are passionate dreamers who have deeply felt convictions about what should be achieved by individuals or through institutions of society. In addition, successful leaders have learned how to communicate their visions to others and inspire participation in the achievement of that vision. The ability to communicate implies being articulate in a number of verbal and nonverbal ways as well as being able to design and implement a way to guide an institution or system through a process that will help make that vision a reality. The first three competencies lead to the fourth.

What is needed at this time in the history of this nation is leadership that can implement the concepts of strategic planning and management, to go beyond critical assessment and audit to create visions and preferred scenarios. Only a few years ago, we were trying to envision the paperless office and the automated factory; today, they are rapidly becoming a reality. What will education and training be like in the school of the future, the electronic college, or the learning community? Cetron (1985), Cline and Sinnott (1983), Jennings and Cornish (1980), Niebuhr (1984), Perelman (1984), and Pogrow (1983) offered suggestions about such a scenario.

Research and Teacher Education

Developing scenarios of preferred futures will require the active participation of vocational educators in cooperation with a broad range of establishments and providers of education and training services. Research teams must deal with tough issues such as the nature of society in the year 2000 or 2020, the nature of work, and the purposes of vocational education. Research teams must then attempt to translate those preferred scenarios into the human resource development needs to staff the school of the future, the electronic college, and the learning community. This would result in a redesigned teacher education program. In addition, structured inservice teacher education programs would have to be developed to meet the professional development requirements of the new information age paradigms.

Conclusion

The educational reform movement acknowledges the enormous primacy of education and training—learning is the capital-forming industry of an advanced society. If we are to be the beneficiaries of the technical society, we must rethink the way we manage the learning tasks of an advanced society. We must create visions of preferred scenarios and then develop goals and objectives to which we can link purposeful human activity and other resources.

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